Structure Functions in e+Au for the White Paper

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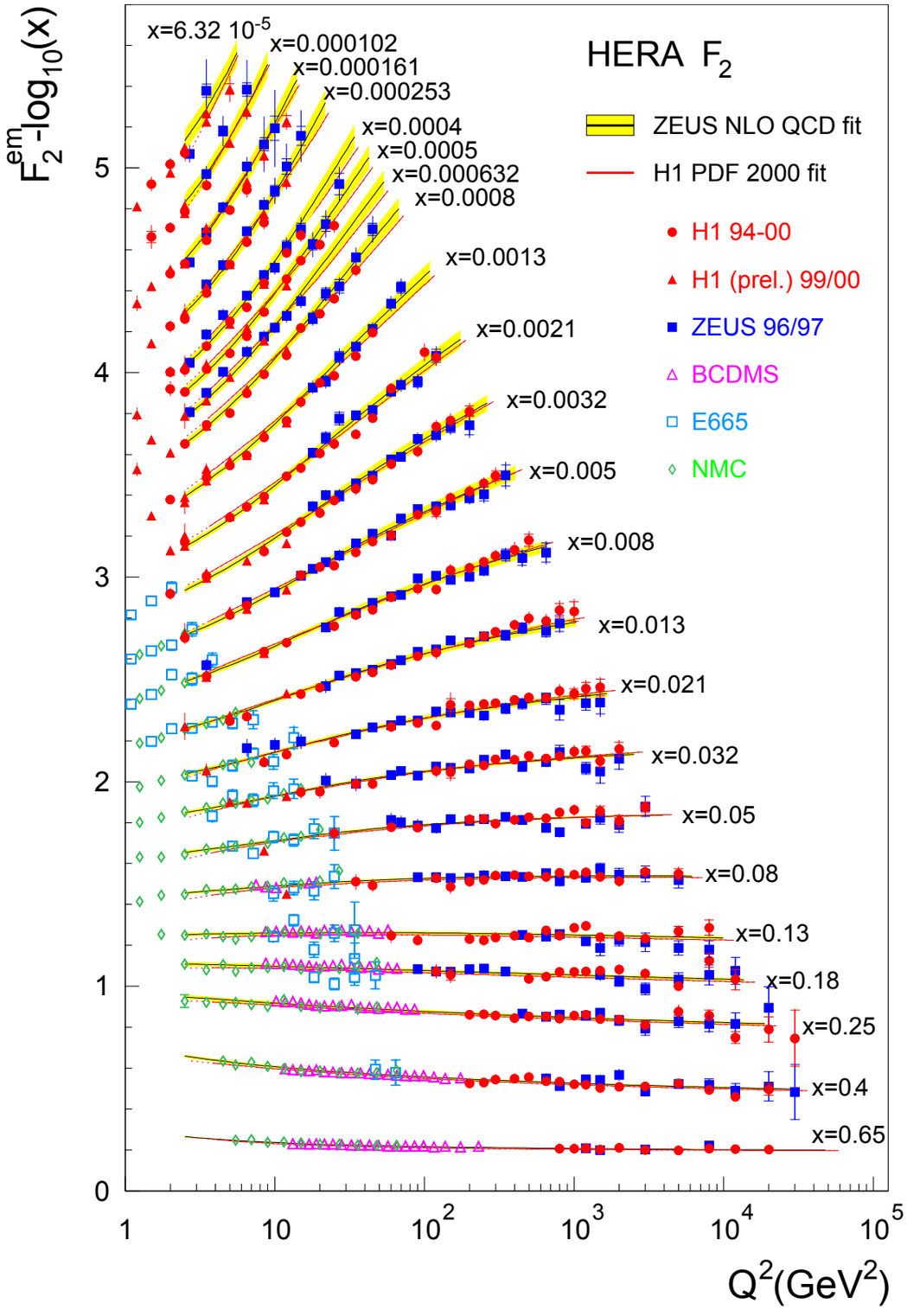
F_2 Structure Function

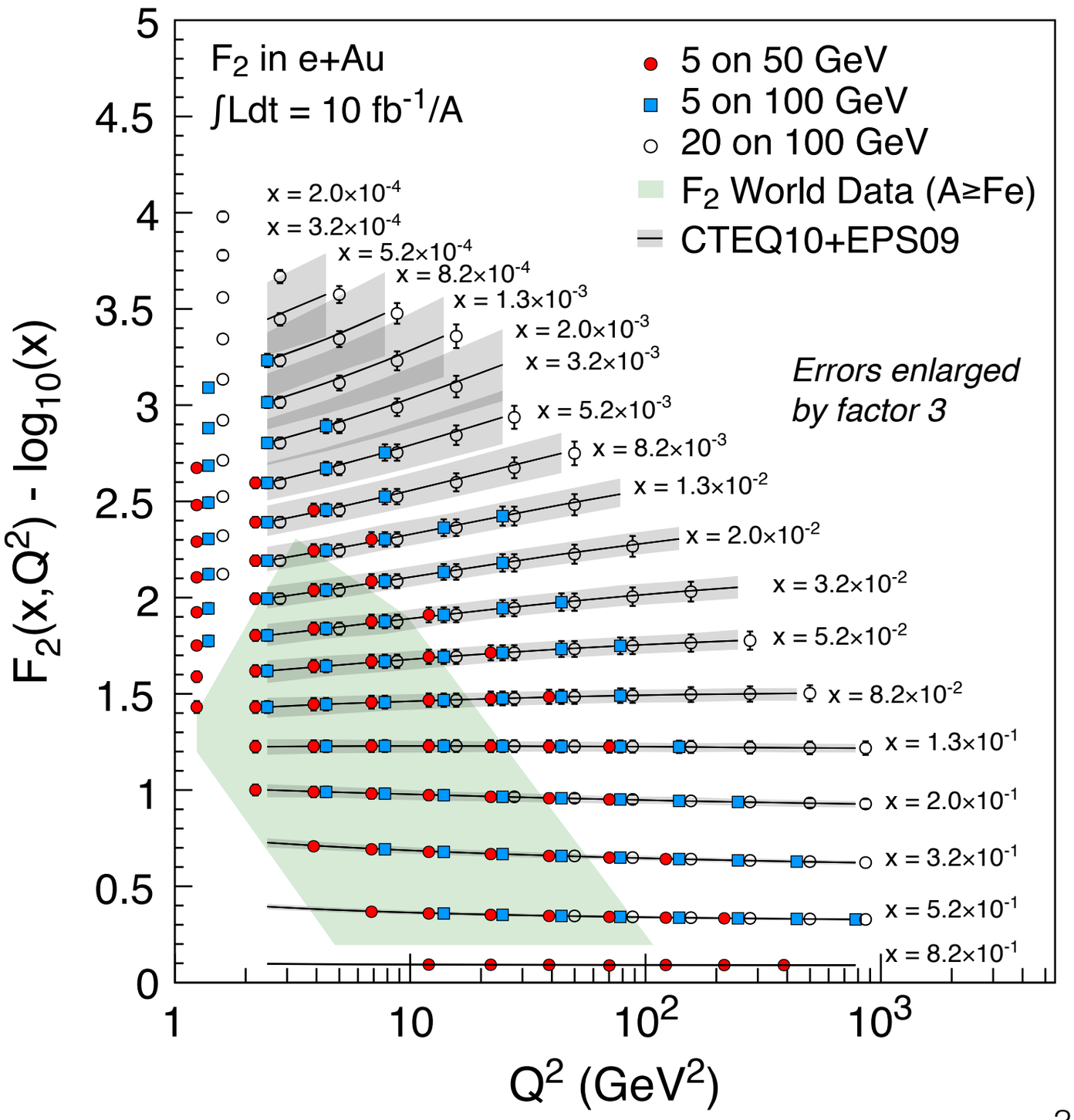
$$\sigma_r(x,Q^2) = F_2^A(x,Q^2) - \frac{y^2}{Y^+} F_L^A(x,Q^2)$$

- The F_2 structure function at HERA was measured with great precision for nucleons
  - Wide coverage in x and Q^2
    - Data is well described by a DGLAP fit
- The “scaling violation” leads to a reconstruction of the gluon PDF at low-x



F_2 Structure Function

- Theory curves and uncertainties come from Hannu Paukkunen from EPS09.
- By varying our energies, we can cover a large fraction of phase-space.
- Due to differences occurring when running Pythia with EPS09 PDFs, the eRHIC pseudodata is scaled to fit on the curves.
- We are dominated by systematic uncertainties (~3%).
  - These are enlarged on the plot by a factor of 3 for clarity
- Easily see that at small (x,Q^2), our uncertainties should have a significant effect on EPS09.



F_L Structure Function

- F_L is obtained via a Rosenbluth Separation technique

- Require 3 energies to have entries in each (x,Q^2) bin
  - Severely restricts the available phase-space

- Still an improvement on the HERA F_L measurement for nucleons and no F_L measurement exists for nuclei

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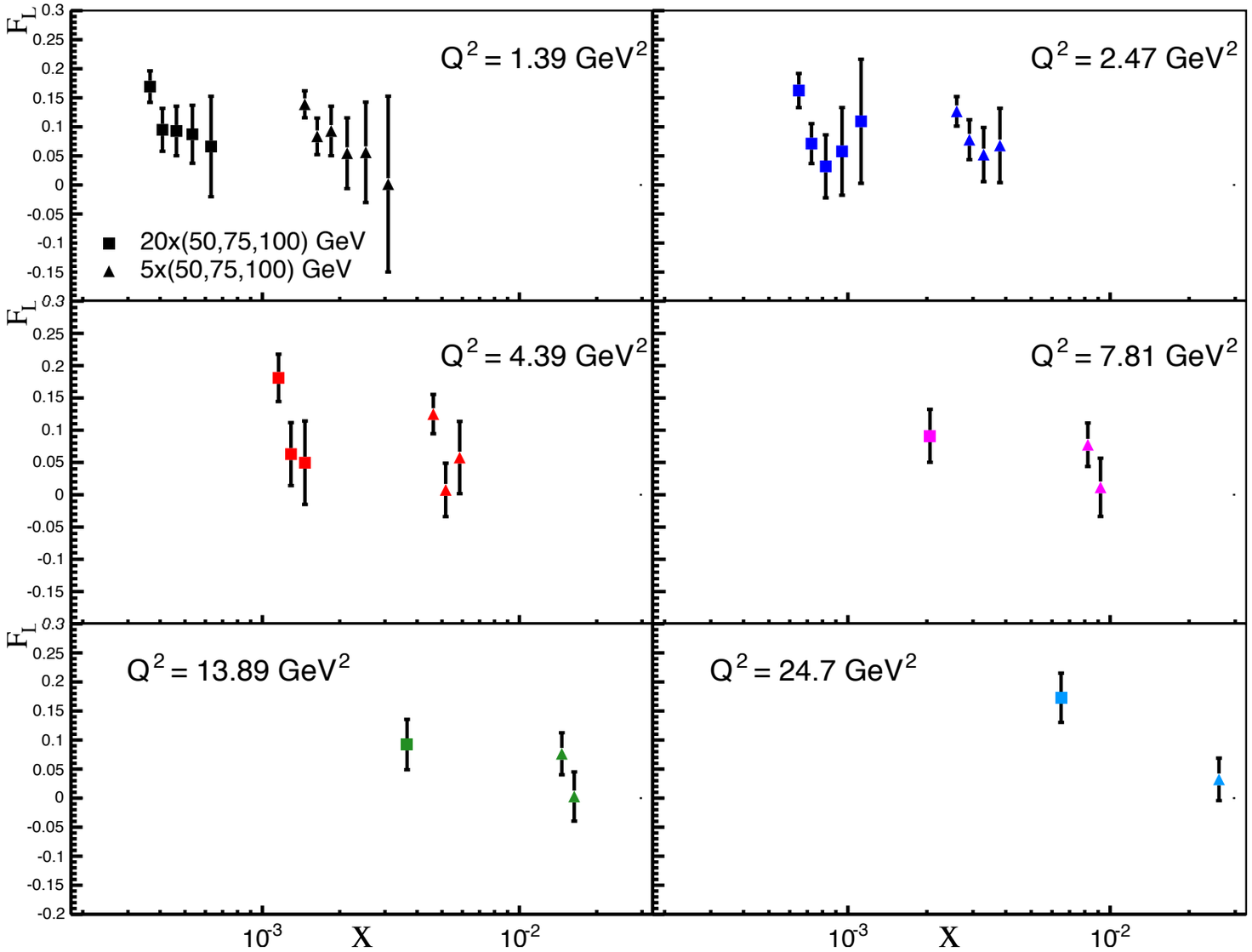

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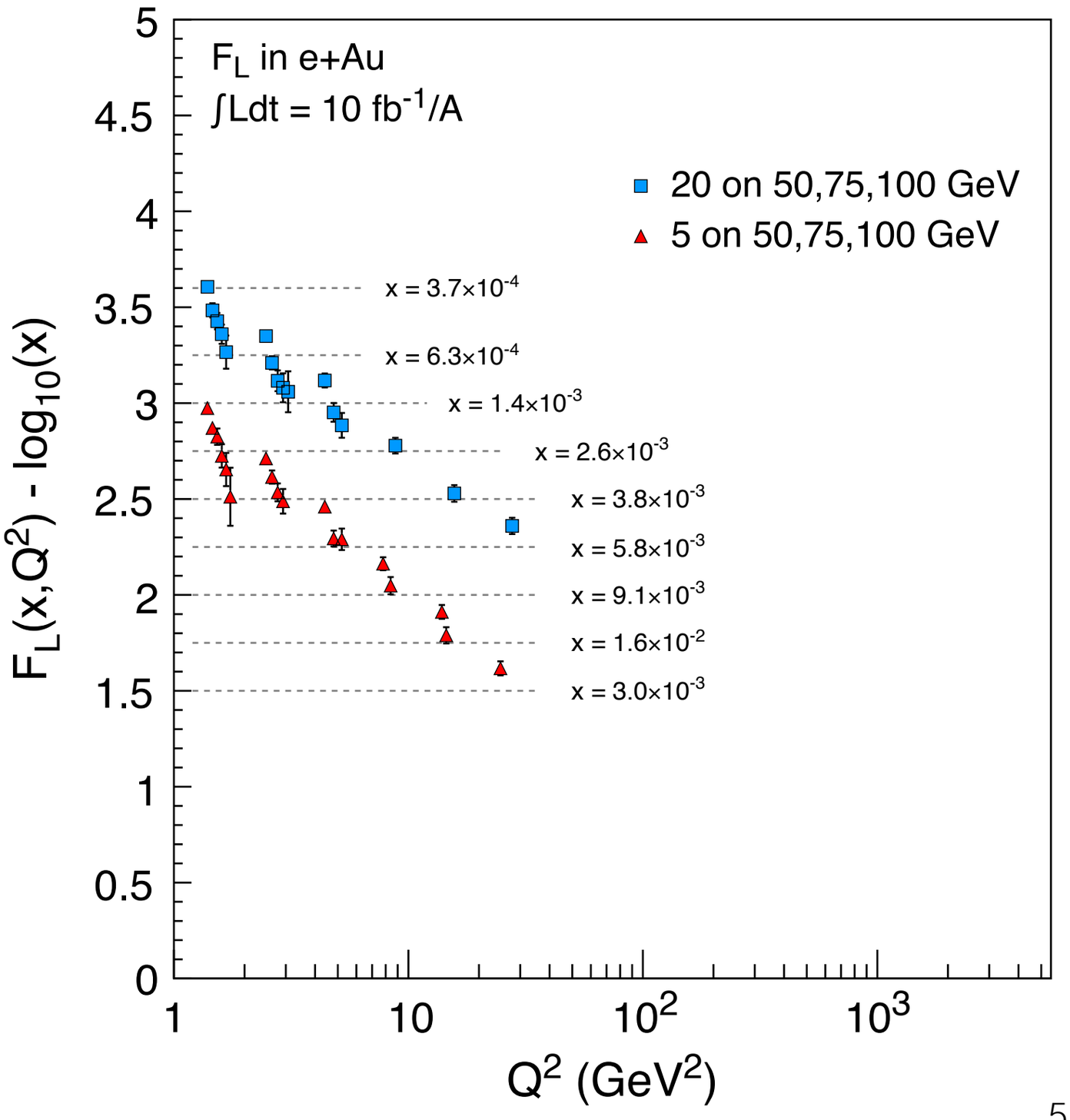


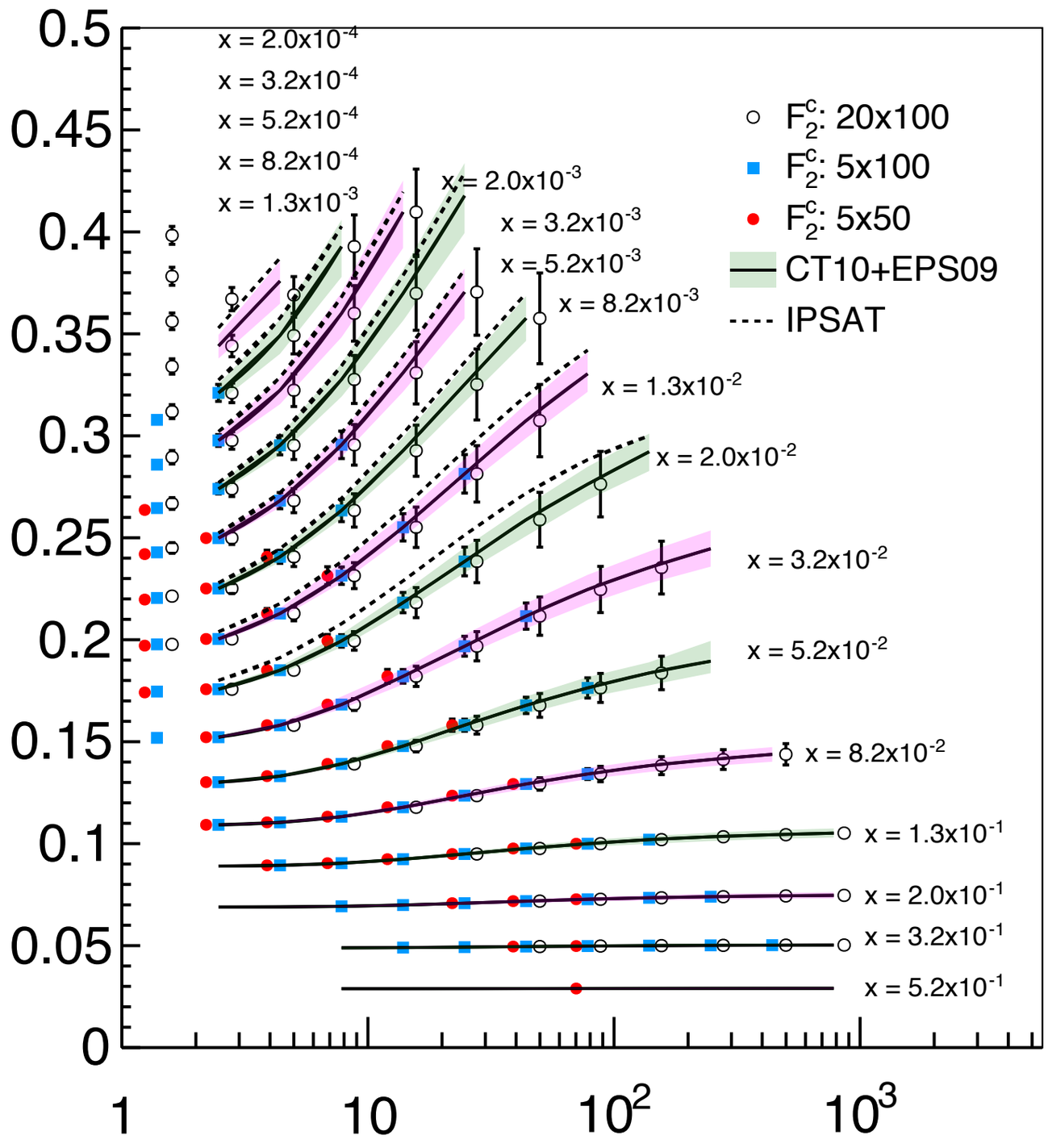
F_2^c Structure Function

- F_2^c structure function is also a way of measuring the gluon distribution

- Again use approximately the same scaling as HERA for the F_2^c. This time, in addition, the points from Cyrille's IP-Sat model are shown

- Whilst differences are observed, it is difficult to quantify this using this scaling

  - Need a plot without any scaling



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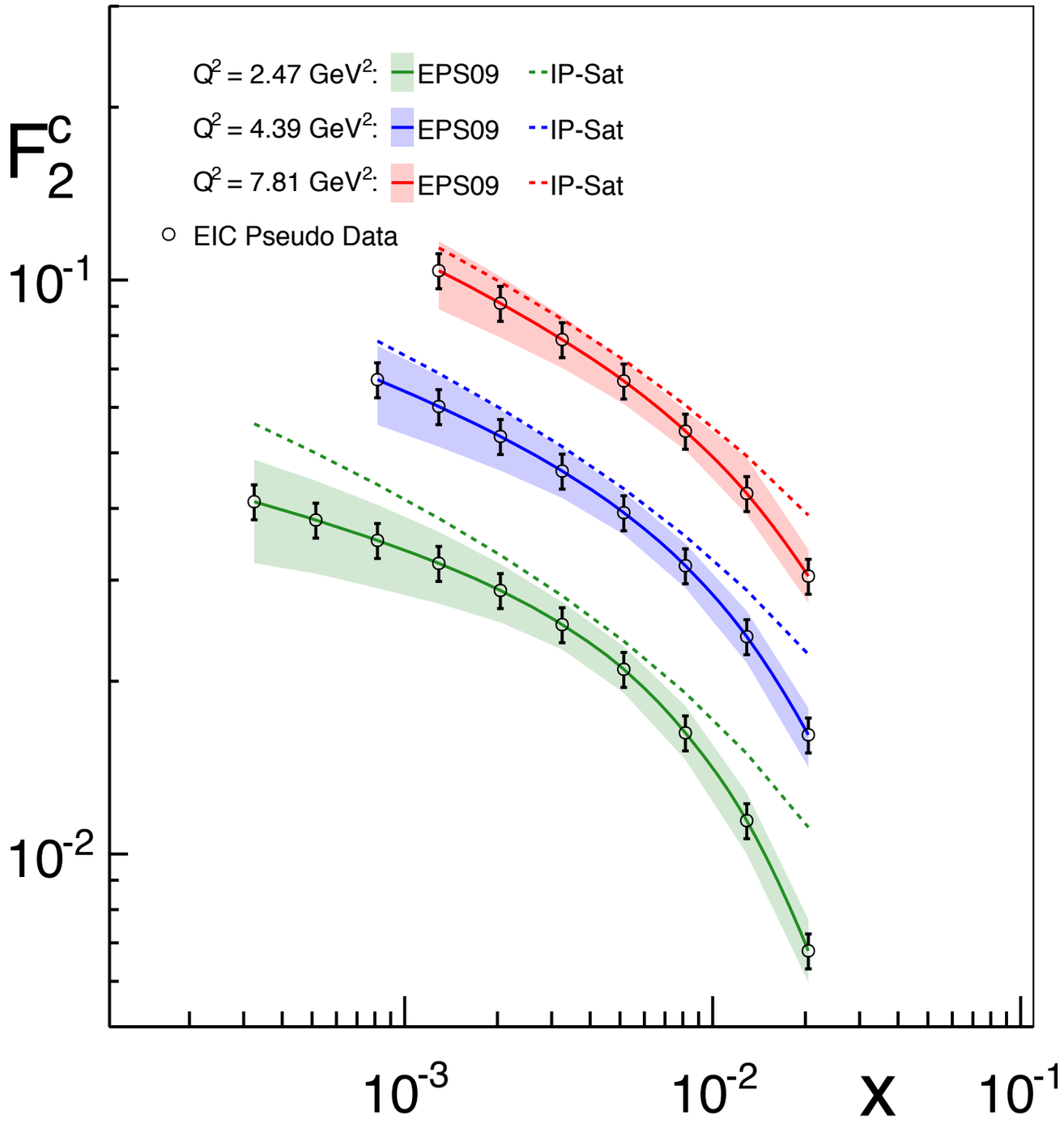
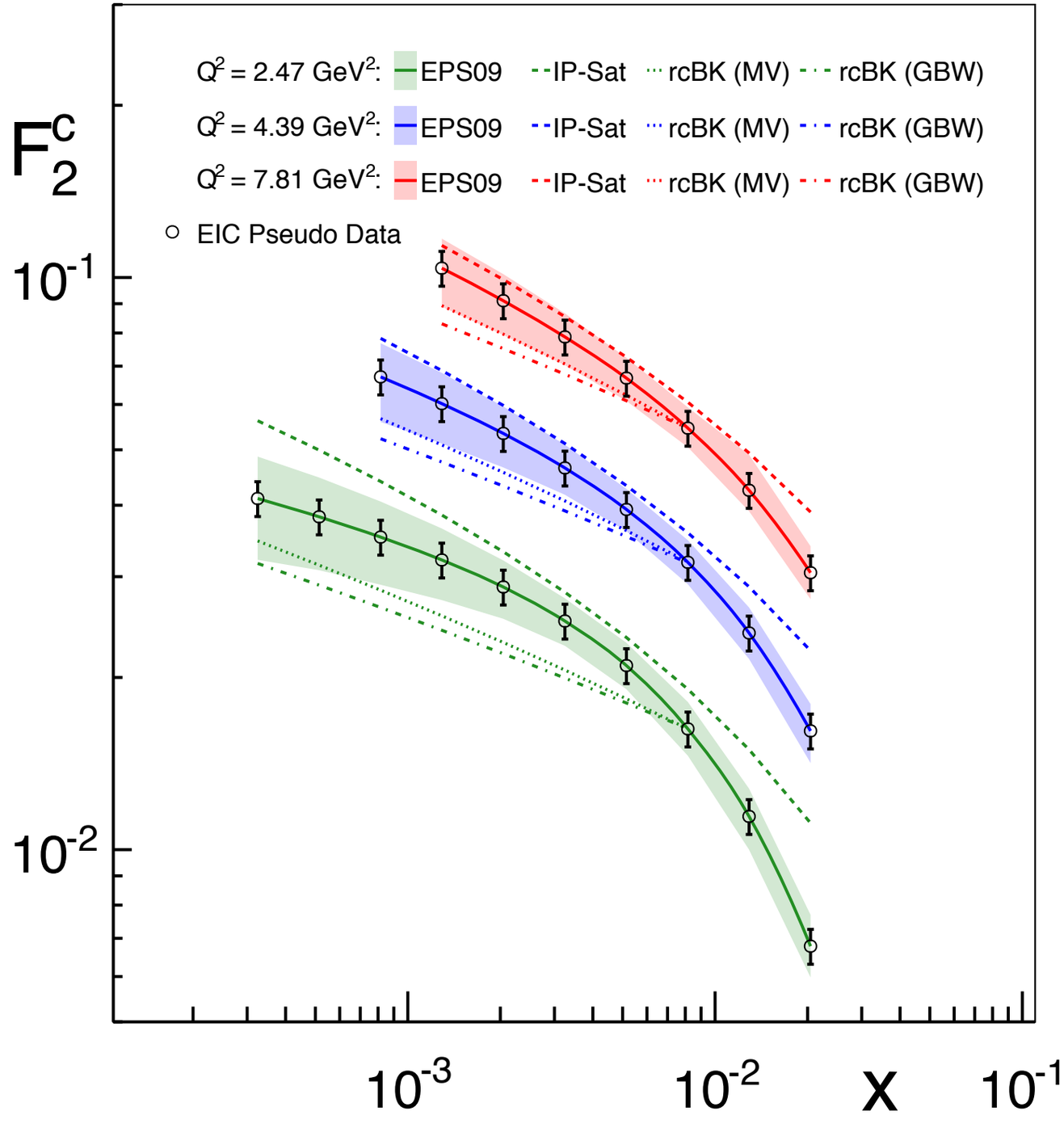


F_2^c Structure Function

- As well as IP-Sat, we have the more theoretically well-defined rcBK
- Javier says that the normalisation is not important here, it is the difference in the evolution with x - so shape of the distribution
- rcBK has been normalized to EPS09 at the highest x bin available to rcBK



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